

PSYCHE.

THE MOUTHPARTS OF THE NEMATOCEROUS DIPTERA, II.

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In the following account of the mouthparts of the Nematocera, that nomenclature of parts is used which represents the interpretation of the mouthpart homologies most widely accepted at the present time. As some nomenclature is necessary and the author's interpretation of the homologies may not, consistently with the point of view adopted in this study, be set out until the testimony of the study has been presented, the nomenclature of common acceptance is naturally used. As the mouthparts of one representative, at least, of each family, are figured from drawings made by camera lucida, the descriptions of the various parts are made very brief. Owing to the limitations of space, in most instances the mouthparts are figured *in situ* alone; in some instances, however, figures of two or three of the isolated parts are given. As all the Nematocerous mouthparts are alike in essential character and arrangement, the figures of the cross sections of the mouthparts of *Blepharocera capitata* illustrate nearly as well the conditions

presented by any other of the mandible-possessing Nematocerous females.

BLEPHAROCERIDAE.

Liponeura? sp. This species is a large undescribed Blepharocerid, taken by me in California, and should probably be made the type of a new genus. The mouthparts of the female consist of the following well developed, independent and easily distinguishable parts shown in figure 1 *in situ* to reveal the relative size and natural position with regard to each other: a labrum-epipharynx (*l. ep*), a pair of mandibles (*md*), a pair of maxillae (*mx*), a labium (*li*) and a hypopharynx (*hyp*).

The *labrum-epipharynx* (fig. 1 A, *l. ep*) is elongate, slender, and pointed, and bears numerous taste pits (?) on its lower (inner) surface which is concave.

The *mandibles* (fig. 1 A, *md*) are long, slender, well chitinized, and each is sharply, finely and conspicuously serrate along the distal half of the inner margin. The mandibles are articulated with the head capsule wholly distinctly from the other mouthparts.

The *maxillae* (fig. 1 A, *mx*) consist of a single short, tapering, blade-like, thin but well chitinized maxillar lobe (*mx. l*) and a long, slender, 5-segmented palpus (*mx*). Lobe and palpus arise from a basal sclerite, which shows no differentiation into cardo and stipes, and may be taken to represent these two sclerites completely fused.

The *labium* (fig. 1 A, *li*) consists of a strong elongate basal sclerite which presents indications of a line of fusion of sub-mentum and mentum, and a pair

have no pseudo-tracheae. There are no palpi.

The *hypopharynx* (fig. 1 A, *hyp*) is as long as or slightly longer than the labrum-epipharynx, is narrower, and although thin, well-chitinized. It lies along the dorsal surface of the labium underneath the labrum-epipharynx.

As shown in figure 1 A, the mouthparts, excepting the mandibles, are carried somewhat forward by the extension of their bases or of the frontal part of the head-capsule. The various parts of the mouth dissect apart readily.

Blepharocera capitata. The mouthparts of the female resemble the mouthparts of the previously described member of the family with, however, certain interesting differences in the labium. The basal sclerite of the labium terminates proximally in a strongly chitinized sub-crescentic portion, much like the sub-mentum of certain orthopterous forms. There are three independent (at least, distally) terminal

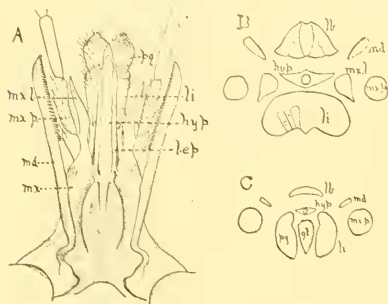


Fig. 1. A. Mouthparts of *Liponeura* ? sp., ♀; *l. ep* labrum-epipharynx, *md* mandible, *mx*, maxillae, *mx. l* maxillar lobe, *mx. p* maxillar palpus, *li* labium, *pg* paraglossa, *hyp* hypopharynx; B, Cross section near the base of the mouthparts of *Blepharocera capitata* ♀; C, Cross section near the tip of mouthparts of *Blepharocera capitata* ♀; lettering in B and C same as in A, with addition in C of *gl* glossa, and substitution of *lb* for *l. ep* (= labrum-epipharynx).

of free fleshy terminal lobes, the paraglossae (*pg*) (see account of *Blepharocera capitata*). These terminal lobes

terminal lobes instead of two, the outer two of which may be taken to be the paraglossae, and the inner median one the fused glossae or inner lobes. Series of cross sections of the mouthparts *in situ* show well the general relation of the parts (fig. 1 B and C), and show that the terminal lobes of the labium are distinct distally, and that the hypopharynx is traversed from base to tip by a cylindrical channel. This is of course the efferent duct of the salivary glands. The sections show plainly the origin

of the hypopharynx from the dorsal surface of the labium (floor of the mouth).

In the male* the mandibles are wanting, the other mouthparts being as in the female.

I have examined the mouthparts of pupae, male and female, of various ages, and find some interesting conditions, but this is ontogenetic study, and we shall for consistency's sake present now only the results of the study of the comparative anatomy of the adults.

SIMULIIDAE.

Simulium sp. In the females of *Simulium* sp. the mouthparts (fig. 2) are of the type presented by *Blepharocera* but present some interesting modifications. The mouthparts are short and broad in general character, instead of elongate. The *labrum-epipharynx* (fig. 2 *l. ep*) is broadly and bluntly triangular and can be readily separated into two lamellae, a dorsal and a ventral one, obviously labrum (fig. 2 *lb*) and epipharynx (fig. 2 *ep*) respectively. The epipharynx presents, at its distal extremity, four minute strongly chitinated processes, evidently mere special chitinizations of the epipharyngeal cuticula. The *mandibles* (fig. 2 *md*) are short, broad (as compared with the mandibles of the *Blepharoceridae*), thin and weakly chitinated. They have a well-defined articulating condyle at

base. The *maxillae* (fig. 2 *mx*) consist

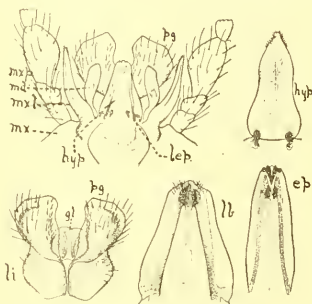


Fig. 2. Mouthparts of *Simulium* sp., ♀; *l. ep* labrum-epipharynx, *md* mandible, *mx* maxilla, *mx. l* maxillar lobe, *mx. p* maxillar palpus, *li* labium, *pg* paraglossa, *g* glossa, *hyp* hypopharynx, *lb* labrum, *ep* epipharynx.

palpus and a single maxillar lobe reaching nearly to the end of the third palpal segment. This is serrate on its inner margin at the tip, and is better developed than in most of the *Nematocera*. The *labium* (fig. 2. *li*) is short, broad, with a short basal sclerite and three terminal lobes, two large free paraglossae, and a median short membranous lobe, the fused glossae. The terminal lobes present no sign of pseudo-tracheae. There are no palpi. The *hypopharynx* (fig. 2, *hyp*) is about as long as the labrum-epipharynx but narrower and its narrowly pointed apex is finely serrate on both margins.

Simulium sp. A second species of

* In the *Zoologischer Anzeiger* no. 557, p. 280, 1898, I have said mistakenly that the mandibles are present in the male.

Simulium examined presented no differences in mouthparts structure.

CHIRONOMIDAE.

Ceratopogon sp. The mouthparts of females present, as shown in figure 3, parts similar to those described for the Blepharoceridae and the Simuliidae. The well-chitinized *labrum-epipharynx* (fig. 3, *lb*) is elongate, broad at base and tapering to a blunt tip which bears two minute processes of the character of those of the Simuliid epipharynx. The *mandibles* (fig. 3, *md*) articulating on either side of the labrum-epipharynx are, with it, borne by a portion of the head capsule produced anteriorly so that the bases of labrum and mandibles lie considerably in front of the bases of maxillae and labium. Each mandible articulates with a slight projecting process of the head capsule. The mandibles are strongly chitinized, elongate, narrow with convex outer margin, and with a few strong, sharp teeth (dentations) on the apical inner margin. The *maxillae* (fig. 3 *mx*) consist of slender 5-segmented palpus (*mx. p*) and single blade-like maxillar lobe (*mx. l*) reaching to end of second palpar segment. The *labium* (fig. 3 *li*) bears but two terminal lobes, the paraglossae, and these appear to be 2-segmented. They

are free and independent to their bases. The *hypopharynx* (fig. 3, *hyp*) is a little

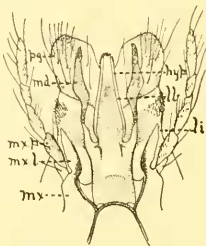


Fig. 3, Mouthparts of *Ceratopogon* sp., ♀; *lb* labrum-epipharynx, *md* mandible, *mx* maxilla, *mx. l* maxillar lobe, *mx. p* maxillar palpus, *li* labium, *pg* paraglossa, *hyp* hypopharynx.

broader than the labrum-epipharynx, is weakly chitinized, and is weakly but conspicuously serrate at its apex.

The males of *Ceratopogon* have no mandibles, and the maxillae have no terminal lobe, and only 4-segmented palpi.

Chironomus sp. In females of *Chironomus* we meet a mouth structure differing essentially from that of females of *Ceratopogon* in that there is lacking in *Chironomus* the mandibles and the maxillar lobes. The mouthparts of *Chironomus* are also short and broad and not elongate as in *Ceratopogon*. *Chironomus* does not possess, as *Ceratopogon* does, piercing mouthparts.

EXCHANGE DESIRED.—Dr. A. Griffini of the University of Turin, Italy, desires to obtain American specimens of *Cybister* and

Dytiscus, pinned or in alcohol, in exchange for Italian insects of any order. Address as above.